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FOR

SYSTEM AND METHOD FOR DISTRIBUTING MULTIMEDIA DISPLAYS OVER A NETWORK

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SYSTEM AND METHOD FOR DISTRIBUTING MULTIMEDIA DISPLAYS OVER A NETWORK

BACKGROUND OF THE INVENTION

The present invention relates generally to methods and systems for distributing multimedia presentations over a network and for scheduling and updating such presentations.

With advances in display technology, digital signage systems have become increasingly sophisticated. No longer restricted to static cardboard displays, digital signs are capable of displaying multimedia presentations that more effectively gain consumer attention. These multimedia presentations may include text, graphics, audio and full motion video.

Digital signage systems may be implemented in a network configuration in which each individual display system has access to a central server that contains multiple presentations and that pushes presentation files to each system. Any changes to the presentations or their scheduling must be generated by an operator at the central server. An example of such a system is disclosed U.S. Patent No. 6,038,545.

SUMMARY OF THE INVENTION

The present invention recognizes and addresses disadvantages of prior art constructions and methods.

Accordingly, it is an object of the present invention to provide an improved system and method for distributing digital multimedia presentations over a network.

This and other objects may be achieved by a process for selectively displaying multimedia presentations. A plurality of presentations are stored on a display system. A scheduling file defines a predetermined schedule by which presentations are displayed at the display system. In response to determining the schedule from the scheduling file, presentations are displayed according to the schedule.

In a system for distributing presentations over a network, a distribution server housing multiple presentations is in communication with a display system over a network. The display system periodically downloads presentations from the distribution server based upon the identification of the display system.

The accompanying drawings, which are incorporated in and constitute a part of the specification, illustrate one or more

embodiments of the invention and, together with the description, serve to explain the principles of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

A full and enabling disclosure of the present invention, including the best mode thereof directed to one of ordinary skill in the art, is set forth in the specification, which makes reference to the appended figures, in which:

Fig. 1 is a schematic illustration of a multimedia distribution system according to an embodiment of the present invention;

Fig. 2 is a schematic illustration of a display system architecture according to an embodiment of the present invention;

Fig. 3 is a schematic illustration of a distribution server architecture according to an embodiment of the present invention;

Fig. 4 is a flow chart illustrating the steps for login and synchronization of a display system according to an embodiment of the present invention;

Fig. 5 is a flow chart illustrating the steps for login and modification of scheduling file by a display administrator according to an embodiment of the present invention;

Fig. 6 is a flow chart illustrating the steps for login and upload of media content and director files by a content administrator according to an embodiment of the present invention; and

Figs. 7 - 19 illustrate user interface functionality for a display administrator according to an embodiment of the present invention.

Repeat use of reference characters in the present specification and drawings is intended to represent same or analogous features or elements of the invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Reference is made in detail to presently preferred embodiments of the invention, one or more examples of which are illustrated in the accompanying drawings. Each example is provided by way of explanation of the invention, not limitation of the invention. In fact, it will be apparent to those skilled in the art that modifications and variations can be made in the present invention without departing from the scope or spirit thereof. For instance, features illustrated or described as part of one embodiment may be used on another embodiment to yield a still further embodiment. Thus, it is intended that the

present invention covers such modifications and variations as come within the scope of the appended claims and their equivalents.

One or more of the preferred embodiments of the present invention as described below operates within and/or in conjunction with a network. Generally, such a system includes multiple memory storage and computing devices located remotely from each other. The execution of program applications may occur at these remote computing sites as data is transferred among the memory devices and by between the computing devices over an extended system. Examples of networks include the Internet, local and wide area networks, virtual private networks, and point-to-point systems. The Internet is a global accumulation of computer networks linked by routers that direct communication among the networks through an information retrieval system, most commonly the World Wide Web.

Certain operations and processes described herein are executed by one or more computers within a network. As should be well understood, a computer transforms information in the form of electronic signals input into the computer to desired output. The input may be provided by a human operator, another computer, or from other external sources. To accomplish these functions in one computing environment, a conventional general

purpose computer includes a processor, read-only and random-access memory, a bus system and input/output systems to transfer information within the computer and to interact with external devices. The computer's memory includes an operating system and various application programs that run on the operating system.

Referring to Fig. 1, an exemplary multimedia distribution system includes a plurality of display systems **12**, a plurality of display administrators **16** (only one of which is shown in Fig. 1) and a plurality of content administrators **18** (only one of which is shown in Fig. 1) connected to a distribution server **14** via a network **10**. Each display system **12** drives a respective display **20** with multimedia presentations and is capable of periodically downloading updated content and scheduling information from distribution server **14**. Display administrators **16** determine the content that is provided on specific display systems **12** and the schedule for displaying the content on specific displays. A given display administrator **16** may control the content and scheduling for multiple display systems **12**, depending upon which display systems **12** are associated with the display administrator. Content administrators **18** control a master set of content from which display administrators **16** can choose in determining the content to display on particular display systems **12**.

Although network **10** is generally described herein as the Internet, the method of exchanging data within the present system is not limited to the Internet and may be implemented in the context of any network environment. It should be clear to one of ordinary skill in the art that display systems **12**, display administrators **16**, content administrators **18** and distribution server **14** can be networked using various suitable devices, platforms and network architectures.

Referring to Fig. 2, each display system **12** drives at least one display **20** with a multimedia presentation through a suitable connection, for example hard wire or wireless. The term "display" is meant to be broadly used to encompass any electronic screen capable of displaying information, such as a liquid crystal displays ("LCD"), plasma displays or cathode ray tube (CRT) monitors. Each display system **12** may simultaneously drive multiple displays either individually or as a group. In other words, the display system may drive the displays so that they provide the same or different presentations.

Display systems **12** need not be configured with proprietary hardware, but may be built with off-the-shelf components. It should be clear to one of ordinary skill in the art that display systems **12** may be configured from any general-purpose computer, with a processor, memory storage, video card and means for

communicating with a network. Depending upon the required flexibility, display system **12** could also be implemented in an imbedded system specifically programmed to display presentations and update the content with information on distribution server **14**.

Display systems **12** may execute projector software, for example using MACROMEDIA DIRECTOR available from Macromedia, Inc. of San Francisco, California, that allows a selected multimedia presentation to be played on a given display. MACROMEDIA DIRECTOR can be used to create a standard projector file or a stub projector file. With a standard projector file, the media content and its director file, which directs the display of the content within a given presentation, are compiled into a single executable file. Alternatively, the media content may be stored externally of a stub projector file, which just contains directions of the presentation and the location of the media content to be played in the presentation. In one embodiment, the projector software is a customized stub projector that reads an external scheduling file to determine the director file, which in turn contains both presentation directions and the location of the media content to be played in the presentation, and the timing at which presentations are to be played.

Thus, the system employs scheduling files to identify presentations to be displayed at a given display system and the timing at which the presentations will be played. Although the function and structure of scheduling files will be further described herein in more detail, the following is an example line from a scheduling file that may be helpful in understanding the function of the custom stub projector:

```
[#type:#display, #when: [#hour:06, #minute:00], #where:1,
#media: [[#filename:"fulldemo.dir", #coords:[426,240]]]]
```

The custom stub projector may be written with instructions, preferably in the LINGO language, that allows the projector to parse lines of the scheduling file. In the example, the projector realizes that the presentation controlled by the director file "fulldemo.dir" should be played at 6:00 a.m. The director file resides in the local directory from which the stub projector runs and includes the location of the file(s) containing the content itself. Although it is believed that use of a stub projector in the above-described manner is new, the description herein should provide one of ordinary skill in the art with the necessary information for the creation and use of such a custom stub. Accordingly, the programming instructions

used to create such a stub projector will not discussed in detail herein.

Display systems **12** update presentations and scheduling through a file synchronization application that periodically connects to distribution server **14** and downloads current presentation content and scheduling files to a database located at the display system. Distribution server **14** does not push information to display system **12**; instead, each display system **12** periodically checks for updates and downloads information particular to the display system.

Synchronization software, for example ROBOCOPY, is used to synchronize display systems **12** and distribution server **14**. ROBOCOPY is distributed with WINDOWS NT Resource Kit and allows a directory on a display system **12** to mirror a directory on distribution server **14** corresponding to the display system by periodically copying files that are new or modified to the display system from the distribution server's corresponding directory and automatically deleting files from the display system that no longer exist on the distribution server directory. ROBOCOPY has the ability to recover from a partial download of a file. For example, if a display system is disconnected from the distribution server during a download of a large file, ROBOCOPY can continue the download from the point

that the display system was disconnected, instead of restarting the download of the entire file.

Display systems **12** may communicate with a network provider using any suitable network communications device, for example using an analog modem, cable modem, DSL modem, T1 connection, T3 connection, OC3 connection, OC12 connection, OC48 connection, OC192 connection or any other network connection technique. As previously mentioned, devices used in the present system may be networked using any of a variety of network configurations. If the Internet is the medium for information exchange, display systems may access the Internet using any suitable Internet service provider. By connecting to the Internet service provider, the display systems thereby have access to the Internet.

Referring also to Fig. 3, the presentation content and scheduling files are initially located on distribution server **14**, which has a separate directory for each display system **12**. Each respective directory is identified by an identification unique to its corresponding display system. The content and scheduling files for each display system may reside in the respective directories or may reside in one or more general directories from which they are linked to the respective directories by an association file. In other words, a table or

other data structure maintains a set of associations between the respective directories and the content and scheduling files located elsewhere on the distribution server. Each respective directory contains a status file having a direction to the association file or a direct link to the presentation content and scheduling files corresponding to a specific display system.

To retrieve these files, the display system's file synchronization application (e.g. ROBOCOPY) establishes a connection over the Internet 10 (Fig. 1) to distribution server **14**. Based upon the file system in use on the distribution server, such as the SAMBA interface illustrated in Fig. 3, the display system is automatically sent to its corresponding (home) directory on the distribution server. Where an association table is used, the status report in the home directory directs the display system to the table, which then identifies the content and scheduling files available to the display system. The file synchronization application then synchronizes the display system with those files. As should be understood in this art, the SAMBA interface is a file management system that defines directories and files that are available to a given user. Other suitable file sharing systems, such as COMMON INTERNET FILE SYSTEM ("CIFS"), NETWARE, APPLETALK AND BANYAN VINES, could also be used.

The display systems may be grouped so that the systems in each group share a common identifier. Thus, the grouped display systems have access to the same presentation content and scheduling files.

Referring to Figs. 1, 3 and 7 - 19, display administrators **16** and content administrators **18** may include web browsers through which these entities access distribution server **14** to manipulate the content and schedules available to the display systems. Although access using a web browser was chosen for simplicity and platform independence, it should be clear to one of ordinary skill in the art that various other techniques for accessing and modifying data on a server could be substituted. Although browser software communicates with distribution server **14** preferably using HTTP, the present system and method could be adapted to networks that do not employ HTTP.

In order to access data on the distribution server's database via a web browser, distribution server **14** runs web server software capable of communication with a database housing content and scheduling files. Any suitable web server software, such as Apache or Internet Information Server ("IIS"), could be used. Accordingly, the distribution server hosts a web site that provides display administrators **16** and content administrators **18** an interface to the database. The web site

preferably dynamically generates web pages using PHP, Active Server Pages ("APS"), or any other language capable of dynamically generating web pages. Through the web site, display administrators **16** may choose presentations for, and content administrators **18** may upload additional content for, particular display systems **12**. This process is described in more detail below.

Since distribution server **14** runs web server software to provide access to display administrators **16** and content administrators **18**, distribution server **14** may be implemented using any technique that increases the performance of web servers. As a result, distribution server **14** may actually be split across more than one physical computer using, for example, load balance techniques such as DNS balancing. DNS balancing uses multiple identical copies of the site on separate physical computers. The DNS server for the hostname of the site, such as www.sample.com, is set up to return multiple IP addresses for the site. The DNS server can do this by either just returning more than one IP address for the hostname or returning a different IP address for each DNS request it receives. Accordingly, multiple users accessing the same web site will actually be accessing different computers to balance the load on the web server.

Distribution server **14** houses four types of data that are used by display systems **12** to run multimedia displays and control the scheduling of the displays: media content files, director files, scheduling files and status files. Media content files contain the raw segments of data that are used to build a multimedia presentation. For example, media content files may be sound, video segments, pictures, text, or other content that is desired in a multimedia presentation. The particular format of the content files depends on the display system used and is not, in and of itself, part of the present invention.

Director files arrange a set of media content into a multimedia presentation. They are the files run by the previously-mentioned projector software to display the multimedia presentation. Each display system **12** may have multiple director files and corresponding content media so that multiple multimedia presentations can be displayed by a display system **12**.

Scheduling files determine the timing at which display systems play the director files. Scheduling files are text files that are read by the projector software to determine the sequence and timing at which presentations are played. An exemplary scheduling file may have the following format:

```
[#year:2000, #month:11, #day:21, #hour:17, #minute:41,
#second:0]
    [#type:#display, #when: [#hour:06, #minute:00], #where:1, #media:
[[#filename:"fulldemo.dir", #coords:[426,240]]]]
    [#type:#display, #when: [#hour:09, #minute:00], #where:1,
#media: [[#filename:"fulldemo1.dir", #coords:[426,240]]]]
    [#type:#display, #when: [#hour:10, #minute:00], #where:1,
#media: [[#filename:"fulldemo2.dir", #coords:[426,240]]]]
    [#type:#display, #when: [#hour:12, #minute:00], #where:1,
#media: [[#filename:"fulldemo3.dir", #coords:[426,240]]]]
    [#type:#display, #when: [#hour:14, #minute:00], #where:1, #media:
[[#filename:"fulldemo4.dir", #coords:[426,240]]]]
```

The first line in the scheduling file sets forth the creation date of the file. The projector software periodically checks the scheduling file's creation date to determine if a new file has been downloaded since the previous check. If the projector software determines that the creation date has changed, it loads the remaining lines in the scheduling file to determine the new presentation schedule. As described above, each subsequent line identifies a director file and the time it should be played. Schedule execution is discussed below.

Scheduling files are automatically generated on distribution server **14** based upon entries made by the display administrator that are stored in an SQL database housed on the

distribution server. A script pulls the appropriate information from the database and puts the information in the proper format for a scheduling file. The function and entries made by a display administrator will be further described in more detail below.

Scheduling files may take into account dynamically generated external data in order to determine which director file to play. For example, scheduling files may dynamically schedule the times for playing director files based upon real time point-of-sale ("POS") data. In this case, the projector software may be programmed to not only read the scheduling file, but also to read an external file that contains the relevant data. Depending upon the external data, the projector software may override the values in the scheduling file. For example, where the content is a restaurant menu or retail store advertisement, the external file may contain an inventory list that is dynamically updated by the store's cash register system. If sales of certain items slow, as indicated by the inventory population, the external file may change the scheduling file to present displays intended to encourage sale of those items. Similarly, the external file may contain dynamically updated weather data that may be used to change advertisements in a store whose sales traffic is affected by the weather.

Furthermore, a user controlling the display system may optionally override the scheduling file by typing page up/page down buttons on the display system keyboard to scroll through presentations.

Each display system **12** creates a status file containing system information such as memory, processor speed, and system status, that is periodically uploaded to distribution server **14**. The status file also includes a time stamp of the connection to the distribution server, a list of media content and director files on the display system, and a list of applications currently running on the display system. Each time that the display system connects to the distribution server, the status file is also uploaded to the distribution server.

Referring to Fig. 4, there is shown a flow chart illustrating the periodic synchronization of display systems **12** with distribution server **14**. Instead of pushing content to display systems **12** from the distribution server **14**, display systems **12** periodically connect to distribution server **14** and download updated information. Upon startup, and periodically during operation, each display system **12** connects to distribution server **14** to download any updates. The display system runs a set of scripts to control the periodic synchronization. For example, a start-up script automatically

uploads status information to the distribution server upon powering-on the display system. A synchronization script launches ROBOCOPY periodically to synchronize content and scheduling files with the distribution server.

When synchronizing with distribution server **12**, display system **12** logs into distribution server **14** using the display system's unique identifier. As a result, display system **12** has access to the directory corresponding to its unique identifier (i.e. its home directory). Next, display system **12** synchronizes with the content media, director files and scheduling files in (or linked to) the directory. That is, the display system downloads any new or modified files on distribution server **14** and deletes files that no longer exist on the distribution server. Once display system **12** is synchronized, the status files are updated, and any errors occurring in the download or operation of the display system **12** are noted and uploaded to the distribution server. At that point, display system **12** logs off of distribution server **14**.

Referring to Figs. 5 and 7 - 19 there is shown a flow chart illustrating the interaction between a display administrator **16** (Fig. 1) and distribution server **14**. Display administrators **16** determine the content available to specific display systems, or group of display systems, through the director files and

scheduling files. As discussed above, display administrators **16** log in to distribution server **14** via a web browser. The distribution server's web server software presents a web page that prompts the display administrator for its user name and password as shown in Fig. 7. Although an example graphical user interface is shown in Figs. 8 - 19, it should be understood that numerous interfaces could be designed which obtain the information needed from the display administrator.

Referring to Fig. 8, if the display administrator successfully enters the login information, the web server software presents a user interface to modify and create scheduling files for a set of display systems. On the left portion of the interface, the display administrator is presented with tabs for "displays", "playlists" (i.e. scheduling files), "schedules", "upload" and "logout". With the "displays" tab selected, the interface shows each display that the display administrator has permission to control. The columns, from left to right, have rows for each display system that show a status indicator, display system name, display system description, and the current presentation being displayed. The status indicator corresponds to the status file. It is green if the display system has not reported any errors, but is red if errors have been reported by the display system. The current presentation

is preferably an animated GIF ("Graphics Interchange Format") that simulates the presentation currently being displayed by the display system.

More detailed information is displayed in the interface page shown in Fig. 9 by selecting a specific display system under the previously-mentioned display name column. In addition to the information provided by the general "displays" tab, the display administrator may view, edit, reschedule or delete presentations for a specific display.

A complete list of director files that the display administrator has permission to use is displayed by selecting the "playlists" tab as illustrated in Fig. 10. A display administrator adds a director file to the list by simply selecting the "add" hyperlink, at which point the system presents a text box as illustrated in Fig. 11. Once the display administrator types in a description for the scheduling file, such as "sample playlist," it is added to the list as illustrated in Fig. 12. By selecting a specific scheduling file description name, such as "sample playlist," additional information, such as scheduling information and a playlist description, is displayed for the director file as illustrated by Fig. 13.

By selecting the "edit" hyperlink adjacent to a particular director file, the display administrator is presented with a new interface that allows selection of different director files and scheduling assignments as illustrated in Fig. 14. If the "menu" button is selected, a set of presentations to be selected is shown in a new window as shown in Fig. 15. Once a presentation is selected, the selected presentation is shown under the "description" column in Fig. 16. Additionally, the display administrator can select the time that the presentation will start to be displayed. That is, the display administrator defines the time component in the scheduling file for this director file. Beginning at the start time, the display system plays this presentation until the next director file start time, i.e. until a new presentation is scheduled. Once the "ok" button is selected, the new presentation selected for "sample playlist" is shown in the "playlists" interface as shown in Fig. 17.

Referring to Fig. 18, the display administrator can assign and schedule specific presentations for specific display systems by selecting the "schedules" tab. With the "schedules" tab selected, the interface shows each director file that the display administrator has permission to control. The columns, from left to right, have rows for each display system that show

an active presentation indicator, date for starting a presentation, display system name (for the display system on which the presentation will be displayed), and the name of the presentation (i.e. director file). The "active" presentation indicator can either be "yes" or "no". A "yes" means that the presentation will be updated on the specified display system; if "no," the display system will not download the presentation. The "date" column shows the date that the display system will be updated with the specified presentation, assuming the active indicator is "yes."

Fig. 19 illustrates the interface options if the "edit" hyperlink is selected. The display administrator can change the values on the "date" column and the "display" column. Once the display administrator has entered all desired entries, selecting the "logout" tab disconnects the display administrator from the distribution server.

Fig. 6 provides a flow chart illustrating the interaction between a content administrator **18** (Fig. 1) and distribution server **14**. Content administrators **18** control the master set of content files from which display administrators **16** can choose in determining the content to display on specific display systems. Preferably, content administrators **18** log in to distribution server **14** via a web browser in a manner similar to that

discussed above with respect to Fig. 7 for display administrators. The distribution server's web server software then presents an interface (Fig. 8) through which content administrators **18** may upload director files and corresponding media content to the distribution server. Upon selecting the "upload" tab, the content administrator establishes an FTP connection with the distribution server for uploading content and director files. Once these files have been uploaded to distribution server **14**, content administrator **18** may log off distribution server **14**.

For purposes of illustration only, the following example illustrates the use of the present system with respect to the owner of a franchise having a display system **12** in each of four business locations. Initially, the franchiser logs into distribution server **14** as content administrator **18** and uploads a master set of content that could be used by all members of the franchise (i.e. by all display systems for which this particular content administrator is authorized). Next, the owner selects the particular presentations and scheduling for his four display systems **12** by logging in as display administrator **16**. Each of the four display systems **12** is associated with the owner, so the owner can select presentations for each display system **12** and determine the timing at which these presentations will be

displayed. If the owner would like to display the same presentations at each location, the four display systems **12** associated with the owner could be set as duplicates. As the four display systems **12** are powered on, each display system **12** connects to distribution server **14** and downloads the updated information. Periodically, these display systems **12** again connect to the distribution server **14** and download updated data. The owner may choose to change the presentations or scheduling as display administrator **16**. Likewise, the franchiser may upload additional presentations as described above.

While one or more preferred embodiments of the invention have been described above, it should be understood that any and all equivalent realizations of the present invention are included within the scope and spirit thereof. Thus, the embodiments depicted are presented by way of example only and are not intended as limitations upon the present invention, and it should be understood by those of ordinary skill in this art that the present invention is not limited to these embodiments since modifications can be made. Therefore, it is contemplated that any and all such embodiments are included in the present invention as may fall within the literal or equivalent scope of the appended claims.